<u>IN THE SPECIFICATION</u>:

Please amend paragraph number **[0014]** as follows:

[0014] A solder jet apparatus 10 is depicted in the schematic block diagram of FIG. 1. Solder jet apparatus 10 deposits metal on substrate 12 in the form of solder droplets 14. The <u>solder</u> droplets 14 can be directed in an X-Y plane of deflection using a raster scan and blanking system. This allows the solder droplets to be "written" on substrate 12.

Please amend paragraph number **[0015]** as follows:

[0015] The <u>solder</u> droplets 14 are formed from melted metal held in liquid metal reservoir 16. A temperature controller 18 is connected to <u>liquid metal</u> reservoir 16 so that the temperature of the liquid metal held in the reservoir can be kept at a desired temperature that leads to optimum droplet formation and release. For example, the solder eutectic temperature at the point of release is 190° C and its temperature at impact is 183° C. To prevent <u>solder</u> droplets 14 from cooling too rapidly or from oxidizing, a constant surrounding temperature is provided and, if desired, the apparatus can be placed in a container that is either under vacuum or is filled with an inert gas.

Please amend paragraph number **[0016]** as follows:

[0016] The <u>solder</u> droplets 14 can be formed by the application of a driving pressure and a sufficient vibration force. The driving pressure can be provided by pressure inducer 20, which is comprised of a piezoelectric crystal that is driven by a tuning frequency sufficient enough to cause pressure to build up in <u>liquid metal</u> reservoir 16. The mechanical vibration is generated by vibrator 22, which comprises a second piezoelectric crystal that is driven by another tuning frequency, causing <u>liquid metal</u> reservoir 16 to vibrate. The timing of the pressure and the vibrations is established so as to produce uniform droplets of the same consistency. Once the <u>solder</u> droplets 14 are formed, the vibration releases them from <u>liquid metal</u> reservoir 16 and the force of gravity draws them down at a predictable velocity.

Please amend paragraph number **[0017]** as follows:

[0017] ~~Reservoir~~ Liquid metal reservoir 16 further includes a solder jet nozzle 23, which is opened and closed via a solenoid 24. The aperture of solder jet nozzle 23 is selected with a size sufficient enough to generate the droplets of a desired size. The solder droplets 14 are formed having a diameter of micron size, ranging from 40-300. When solenoid 24 is activated, it either closes or opens solder jet nozzle 23.

Please amend paragraph number **[0018]** as follows:

[0018] ~~Droplets~~ Solder droplets 14 pass through several zones before either being deposited on substrate 12 or recycled back to liquid metal reservoir 16. The first zone is a charging field driven by charge driver 26. Charge driver 26 causes charge electrodes 28 to generate an electric field therebetween. As solder droplets 14 pass past charge electrodes 28, they are imparted with an electric charge. With this charge, solder droplets 14 can be deflected at later stages as appropriate.

Please amend paragraph number **[0019]** as follows:

[0019] The second zone is a blanking zone that uses blanking electrodes or coil 30. The blanking electrodes are activated having sufficient electric field so as to cause solder droplets 14 to deflect to a catcher 32. This is the return function of the scanning function as is described below. Catcher 32 catches the liquid solder and causes the metal to be recycled to liquid metal reservoir 16. This prevents solder droplets 14 from depositing on the surface of substrate 12. This blanking can be done in a selective manner so that droplets are deposited in some locations, but not others. Blanking electrodes or coil 30 are controlled by signal controller 34. Signal controller 34 can be a signal processor such as a computer system. The computer system allows greater control of solder droplets 14 by programming the blanking electrodes or coil 30 to turn on and off in a desired sequence so as to pattern the substrate with a desired solder pattern. An alternative embodiment can include an air jet system if the electrical

pulse is insufficient to remove the droplets. A photo cell can be located above the air jet system in order to ~~insure~~ ensure proper timing of electrical pulses or the air pressure.

Please amend paragraph number **[0020]** as follows:

[0020] The third zone is the raster scan system and includes electrostatic deflection plates or magnetic coil 36. ~~Plates~~ Electrostatic deflection plates 36 are charged by signal controller 34 so that solder droplets 14 are deflected in either the horizontal X-direction or the vertical Y-direction, or both. Further, the solder droplets 14 can be held in a steady position in the X-Y plane in order to build up the solder to a desired height. Since the droplet stream now scans in the X- and Y-directions, the substrate 12 can now stay stationary throughout the droplet application process. Signal controller 34 can be programmed to perform a variety of soldering patterns for placing solder droplets 14 on substrate 12. For example, a CAD/CAM system programmed with a desired output sends signals to blanking electrodes 30 and to electrostatic deflection plates 36 to guide the droplet stream in the desired pattern of placing droplets in certain locations, but not in others. Additionally, when the "stream" of solder droplets 14 is returned to the beginning of the horizontal scan, blanking electrodes 30 cause the solder droplets 14 to deflect to catcher 32 so as not to "write" across the substrate during the return scan. The location of blanking electrodes 30 and electrostatic deflection plates 36 can be switched, if desired.

Please amend paragraph number **[0021]** as follows:

[0021] An electronic light sensor 38, which connects to signal controller 34, is positioned so that the solder droplets 14 pass through the electronic light sensor 38. ~~Light~~ Electronic light sensor 38 is used to count the number of solder droplets 14 passing by. This allows signal controller 34 to monitor the droplet output and either blank or pass droplets as needed.

Please amend paragraph number **[0022]** as follows:

[0022] FIG. 2 is a top plan view of the surface of substrate 12 as solder droplets 14 are deposited. A first line 40 scans across the surface, depositing solder droplets 14 in selected positions and leaving blanks 42 in the remaining positions. A return scan line 44, which is ghosted, indicates when the stream of droplets is caught by catcher 32 as the stream returns to the beginning of the next line 40. This process is repeated as often as is necessary with catcher 32 collecting all the blank spots and scan returns. Alternatively, solenoid 24 can be activated to close solder jet nozzle 23 during the return scan. This also prevents unwanted solder droplets 14 from depositing on the surface of substrate 12.

Please amend paragraph number **[0023]** as follows:

[0023] The type of solder used with the solder jet apparatus 10 can include any type of metal solder such as, for example, 63/37 PbSN, 62/36/2PbSnAa, In/Sn.

Please amend paragraph number **[0024]** as follows:

[0024] The ~~system~~ solder jet apparatus 10 can be used for many types of solder application. One type of application includes that of applying uniform solder balls, in the form of solder droplets, to the substrate 12. This provides a universal ball applicator system. Further, the system can repair particular locations where the solder ball application process has failed to insert a desired solder ball. In order to repair any and all solder ball defects, a scan of the surface of substrate 12 can be provided and then a map of the defective areas can be programmed to the signal controller 34. This allows for a rapid repair of the surface of substrate 12 where solder balls had been omitted. Another application is to pre-tin a location on substrate 12. Pre-tinning is accomplished by applying one or more droplets to the same location or to apply droplets in such a manner as to thoroughly cover the surface of substrate 12 or a grid section of substrate 12.

Please amend paragraph number **[0025]** as follows:

[0025] Similar to pre-tinning is pre-plating a board. Pre-plating a board involves applying solder droplets over the entire surface area of the board to cover it with a metal plate. An exposed portion of the board can be selected where desirable. Typically, this area is along the edge of the board either on one edge, two edges, or all four edges, or can be in the center section of the board. Prior methods of pre-plating a board resulted in a problem known as "measling." Measling is where small holes exist in the plating surface that lead to electrical defaults. The use of the solder jet apparatus 10 allows the system to eliminate the measling locations by applying solder directly to those openings. Additionally, using the pre-plating process provided by <u>solder jet</u> apparatus 10 eliminates measling entirely. Just as pre-plated boards may have measling problems, boards that had been stenciled with solder paste had similar problems. These problems can include openings or gaps in the stenciled design. Again, a map of the surface defects can be ascertained and then used by the signal controller 34 to make appropriate correction and repair to those particular problem points. Additionally, large areas can be printed using the X-Y motion of the table in combination with the X-Y slowing of the solder application. Also, the final ball size can be changed on demand. Further, in prior ball application systems that apply 7 balls/sec, the board needs to be moved to a new location. With this invention, no relocation time is required, thus reducing processing time.